

so that the gimbal is prevented from moving. The magnet in the Magnaprobe will turn at the same speed as the bar magnet while the motor is operating. Vary the position of the Magnaprobe in relation to the rotating magnet and observe the effect on the Magnaprobe magnet.

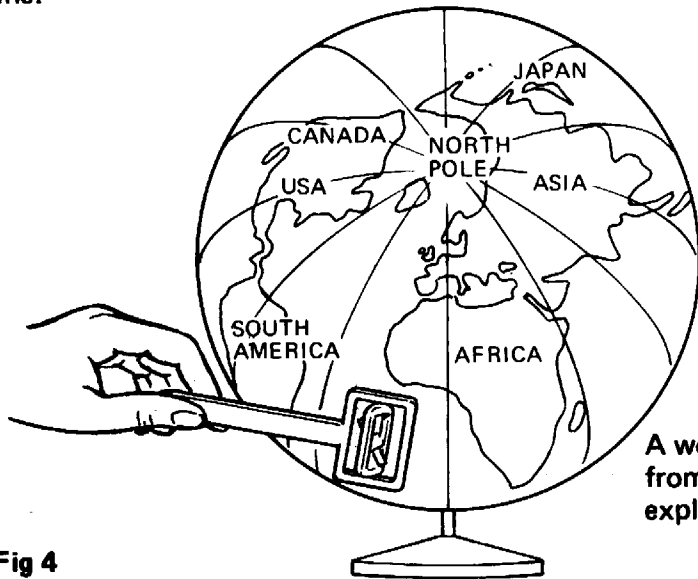
### 7. Terrestrial magnetism

A Magnetic Globe is a conventional physical globe representing the Earth. A strong bar magnet is supported inside the globe, and the direction of the magnet is such that the magnetic field just outside the surface of the globe is representative of the terrestrial magnetic forces around the Earth. The Magnaprobe can be used in conjunction with the magnetic globe to provide a visual indication of the meaning of

i  
*DIP* (also called magnetic inclination) and

ii  
*Declination* (also called magnetic variation or bearing).

Move the Magnaprobe round the magnetic globe in a north-south orbit, ie from the Arctic to the Antarctic, along any chosen longitudinal reference line. Observe the dip angle changing from plus to minus 90 degrees. Observe also changes in declination which may be emphasised by moving the Magnaprobe in an east-west direction, ie along any selected latitudinal line.



A world globe magnetised from the inside being explored by a Magnaprobe

Fig 4

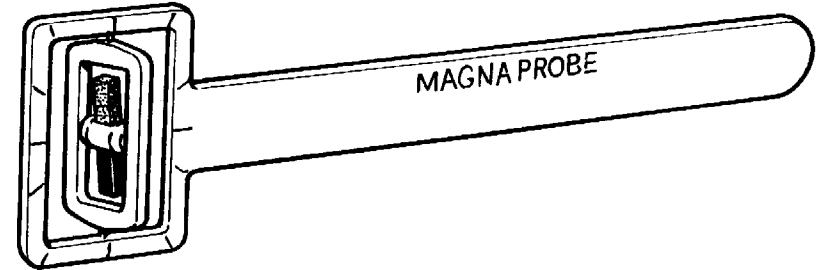
*Note:* The Magnaprobe can also be used in the field by geology students as a guide to the magnetic susceptibility of ferrous type rocks.

ROM-Elektronik GmbH  
D-86488 Nattenhausen  
Grasiger Weg 12  
Tel. 08282-7385  
Fax 08282-7305  
www.rom-elektronik.com

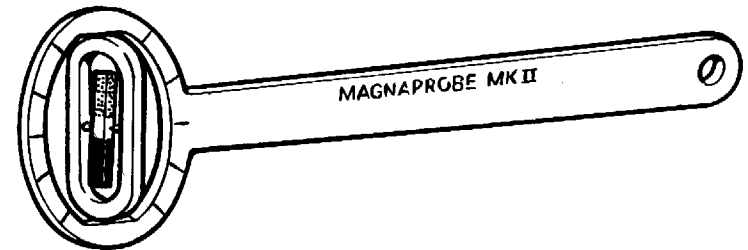
rom  
elektronik



# Magnaprobe



MAGNAPROBE Mark I (with jewelled bearings) reference O199



MAGNAPROBE Mark II reference O198

### Experiments in which the Magnaprobe can be used

- forces between magnetic poles
- magnetism by induction
- exploration and mapping of magnetic lines of force
- magnetic fields between like and unlike poles
- direction of a magnetic field around a wire and coil
- properties of a field produced by an electric current
- terrestrial magnetism — declination and dip

# Magnaprobe

## INTRODUCTION

The Magnaprobe is designed to show the three-dimensional nature of a magnetic field easily and conveniently. It illustrates the true shape of a magnetic field far better than either a plotting compass or iron filings and can be used for individual laboratory or field work or for small scale laboratory demonstrations.

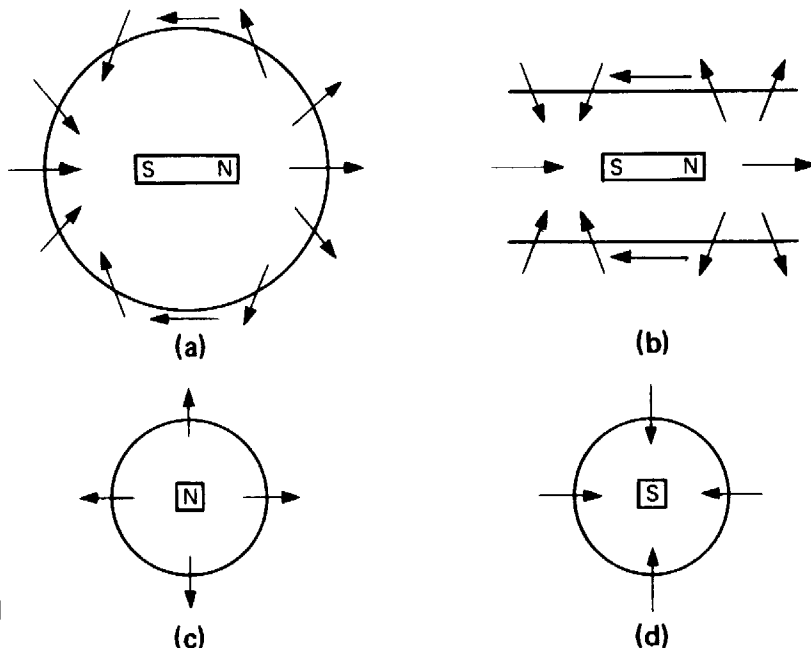
## DESCRIPTION

The Magnaprobe consists of a small bar magnet suspended in a gimbal mounting. The supporting frame, handle and bearing pivots are all constructed to avoid any possible magnetic effects on the probe. The Magnaprobe Mark I is the more sensitive, and has been balanced to show the approximate dip of the earth's magnetic field when the black mark on the central boss is uppermost and facing the nearest pole. Balance is necessary because the density of a scintered magnet is not uniform; the angle shown by the magnet might not be correct when the black mark on the boss is underneath. The Magnaprobe Mark II is designed for work with magnetic fields in a laboratory and is less sensitive than the Mark I.

The Magnaprobe can be held in any desired position or orientation in the magnetic field being investigated. The field is indicated by the small magnet, its north pole coloured red, to show the direction of the field.

## EXPERIMENTS

### 1. The field round a bar magnet



**Fig 1**  
Hold a bar magnet in one hand and the probe in the other. Move the Magnaprobe in a circle round the magnet as in Fig 1a. The arrows indicate the direction of the field as shown by the north pole of the probe.

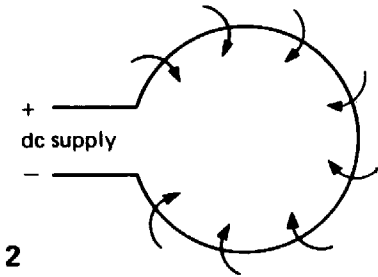
Observe the field pattern. Then move the probe along a line parallel to the magnet's length and again observe the field pattern (Fig 1b).

Next hold the magnet end-on and move the probe in a circle around the north pole (Fig 1c). Repeat with the south pole of the magnet (Fig 1d).

Observe the field pattern in each case.

### 2. The field produced by an electric current in a single-turn coil

Form a loop from a half-metre length of thick copper wire and connect it via an ammeter to a dc supply, Fig 2. A 12V car battery or a variable dc supply unit are satisfactory. Pass a current of 5-10 amps through the loop and observe the shape and direction of the magnetic field. The north pole of the probe indicates the direction of the field.



**Fig 2**

Following on from these two simple experiments the investigation using the Magnaprobe can be made increasingly complex.

### 3. Field strength of different magnetic materials

Permanent magnets are made from various materials and in different shapes. Compare the characteristics of the magnetic field around permanent magnets of similar shape and size which are made of different materials.

**4. Comparison of the magnetic field around magnets of different shape**  
Investigate the magnetic field around magnets of different physical shape and size. Ring magnets and U magnets should be investigated.

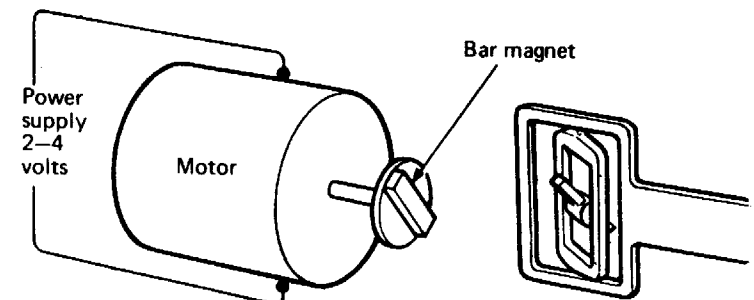
### 5. Variation of field strength with current

Investigate electromagnetism in coils, solenoids, straight core conductors etc.

### 6. Synchronism

Attach a small bar magnet to the end of the shaft of a 2 to 4 volt electric motor. The magnet can be attached with a small piece of adhesive tape to a disc approximately 2 cm diameter fixed on the end of the motor shaft.

Connect a variable voltage supply to the electric motor so that the bar magnet will rotate as the motor shaft rotates. Locate the Magnaprobe near the rotating magnet and hold the plastic gimbal parallel to its outer frame



**Fig 3**